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REMARKS/ARGUMENTS

Claims 1-5, 11, and 13-15 are pending in this application. By this amendment, Applicant amends claim 1.

Applicant filed an Information Disclosure Statement in the Patent Office on October 7, 2003. However, a copy of the Form PTO-1449 was not included in the Office Action mailed November 23, 2003 or the Office Action mailed August 25, 2004. Applicant has provided herewith a copy of the IDS including Form PTO-1449 and a copy of the stamped postcard receipt. Accordingly, Applicants respectfully request that the Examiner consider the IDS and include a copy of the initialed Form PTO-1449 in the next Office Action.

Claims 1-5, 11 and 13-15 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Lemnios et al. (U.S. 5,162,258) in view of Azuma et al. (U.S. 6,447,838). Applicant respectfully traverses the rejection of claims 1-5, 11 and 13-15.

Claim 1 has been amended to recite:

“An MIM capacitor comprising:
a lower electrode comprising a plurality of metal layers including a top metal layer;
an upper electrode; and
a dielectric layer positioned between said lower electrode and said upper electrode,
wherein the top metal layer includes an insulating metal oxide layer disposed on the entire surface thereof;
wherein the lower electrode is formed by a first titanium layer, a platinum layer, a gold layer, and a second titanium layer; and
wherein the insulating metal oxide layer is in direct contact with a surface of the dielectric layer.” (emphasis added)

The Examiner acknowledged that Lemnios et al. fails to teach or suggest an insulating metal oxide layer comprising titanium disposed on the entire surface of the lower electrode. However, the Examiner alleged that Azuma et al. teaches that “it is well-known in the art to include titanium oxide between a dielectric and the capacitor electrode.” Thus, the Examiner concluded that it would have been obvious “to include a

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titanium oxide layer disposed on the entire surface of the second titanium. The motivation for doing so, as is taught by Azuma et al., is protecting the capacitor electrode from the diffusion of unwanted impurities." Applicants respectfully disagree.

Claim 1 has been amended to recite the feature of "the insulating metal oxide layer is in direct contact with a surface of the dielectric layer."

Col. 1, lines 31-44 of Azuma et al. disclose that it is well known that silicon diffuses into other material. "Therefore capacitors which have electrodes made of a metal, such as platinum, usually use a barrier layer, such as titanium nitride or titanium oxide, and an adhesion layer, such as titanium, between the capacitor electrode and a doped polysilicon, silicon dioxide, or silicon nitride layer. See U.S. Pat. Nos. 5,046,043, and 5,005,102." To fully understand the alleged teaching of Azuma et al., Applicant submits herewith copies of U.S. Patent Nos. 5,046,043 (Miller et al.) and 5,005,102 (Larson).

As clearly disclosed in Miller et al. and Larson, the structure of the bottom electrodes of Miller and Larson is very different from the structure of the bottom electrode of the present invention, and none of Miller, Larson and Azuma et al. teaches or suggests a bottom electrode having the structure recited in Applicant's claim 1.

Particularly, in Miller et al., a diffusion barrier layer 16 made of, for example, silicon nitride is formed on a silicon dioxide layer 14, a titanium dioxide layer 18 is formed on the diffusion barrier layer 16 and a bottom electrode 20 is formed on the surface of the titanium dioxide layer 18. The bottom (or lower) electrode 20 of Miller et al. includes two layers -- a bottom layer 22 of titanium and an upper layer 24 of platinum (see col. 3, lines 36-59). Thus, at best, Miller et al. teaches oxide layers 14 and 18 which are disposed under the lower electrode 20, and certainly fails to teach or suggest the features of (1) "the top metal layer includes an insulating metal oxide layer disposed on the entire surface thereof" (emphasis added), and (2) "the insulating metal oxide layer is in direct contact with a surface of the dielectric layer" that is disposed between an upper electrode and a lower electrode as recited in Applicant's claim 1.

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The only oxide layer disclosed in Larson is a titanium dioxide layer 220a. As seen in Fig. 4 of Larson, the titanium dioxide layer 220a is the lowermost layer of the lower electrode 214a. A platinum layer 226a is disposed on top of the titanium dioxide layer 220a, defines the top layer of the lower electrode, and is in direct contact with the dielectric layer (see col. 4, lines 60-68 of Larson). Thus, Larson clearly fails to teach or suggest the features of (1) "the top metal layer includes an insulating metal oxide layer disposed on the entire surface thereof," and (2) "the insulating metal oxide layer is in direct contact with a surface of the dielectric layer" as recited in Applicant's claim 1.

As noted above, Azuma et al. broadly discloses that it is well known to use a titanium oxide layer as a diffusion barrier. However, Azuma et al. fails to teach or suggest any specific arrangement of the titanium oxide layer with respect to the layers of a lower electrode or a dielectric layer, and certainly fails to teach or suggest the features of (1) "the top metal layer includes an insulating metal oxide layer disposed on the entire surface thereof," and (2) "the insulating metal oxide layer is in direct contact with a surface of the dielectric layer" as recited in Applicant's claim 1.

Applicant's invention must be considered "as a whole". Medtronic, Inc., v. Cardiac Pacemakers, Inc., 220 USPQ 97, 99-100 (Fed. Cir. 1983). Rather than considering the invention "as a whole," the Examiner has improperly reduced Applicant's claimed invention to the "idea" of using a metal oxide layer in a lower electrode, and has failed to consider the specific combination and arrangement of layers recited in Applicant's claim 1. Reducing a claimed invention to an "idea" and then determining patentability of that "idea" is error. Jones v. Hardy, 220 USPQ 1021, 1024 (Fed. Cir. 1984).

Accordingly, Applicant respectfully submits that Lemnios et al. and Azuma et al. (and Miller et al. and Larson cited in Azuma et al.), applied alone or in combination, fail to teach or suggest the unique combination and arrangement of elements recited in Applicant's claim 1.

Accordingly, Applicant respectfully requests reconsideration and withdrawal of

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the rejection of claim 1 under 35 U.S.C. § 103(a) as being unpatentable over Lemnios et al. in view of Azuma et al.

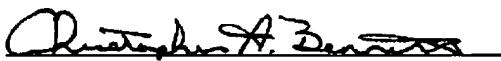
In view of the foregoing amendments and remarks, Applicant respectfully submits that claim 1 is allowable. Claims 2-5, 11 and 13-15 depend upon claim 1 and are therefore allowable for at least the reasons that claim 1 is allowable.

In view of the foregoing amendments and remarks, Applicant respectfully submits that this application is in condition for allowance. Favorable consideration and prompt allowance are solicited.

The Commissioner is authorized to charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account No. 50-1353.

Respectfully submitted,

Date: November 24, 2004


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